ADDRESSING FORECAST CHALLENGES AT THE SATELLITE PROVING GROUND FOR MARINE, PRECIPITATION, AND SATELLITE ANALYSIS IN PREPARATION FOR GOES-16 AND JPSS-1

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NOAA Representatives:
James Clark (OPC), Joseph Sienkiewicz (OPC), Andrew Orrison (WPC), Mark Klein (WPC), James Nelson (WPC), Jamie Kibler (SAB), Nelsie Ramos (TAFB), Hugh Cobb (TAFB), Mark DeMaria (NHC), Christopher Landsea (NHC), Andrea Schumacher (CIRA), Emily Berndt (SPoRT), Mitch Goldberg (JPSS), and Steve Goodman (GOES-R)

8th NOAA Testbeds & Proving Grounds Workshop
04/25/17

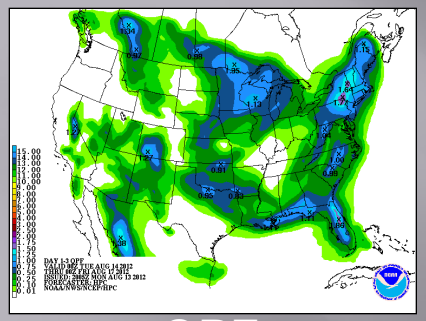
HIMAWARI-8 15 MAY 2015 0002 UTC BAND 03 CIRA/RAMMB

Presentation Outline

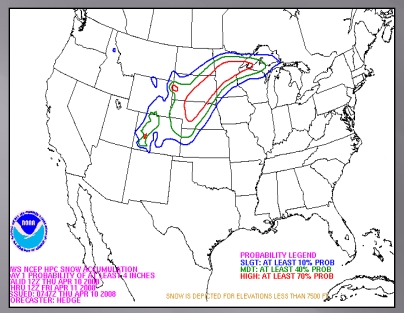
- **Introduce the National Centers that make up the "Satellite Proving Ground for Marine, Precipitation, and Hazardous Weather Applications"**
  - Weather Prediction Center (WPC)
  - Ocean Prediction Center (OPC)
  - Tropical Analysis and Forecast Branch (TAFB) at the National Hurricane Center
  - NESDIS Satellite Analysis Branch (SAB)
- **GOES-R/JPSS Demonstrated Proxy Products**

WPC OPERATIONAL DESKS

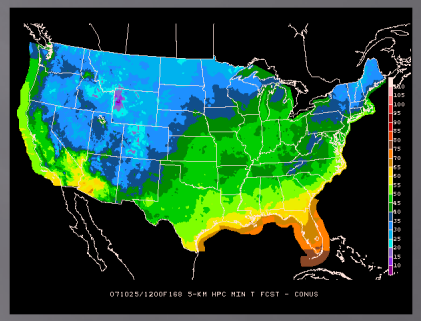
AS OF APRIL 2017: 29/33 FORECASTERS



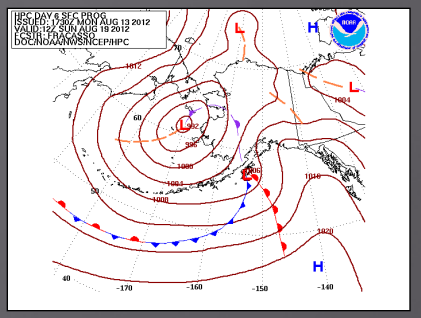
QPF



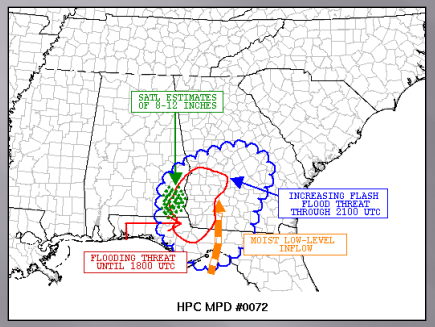
Winter Weather



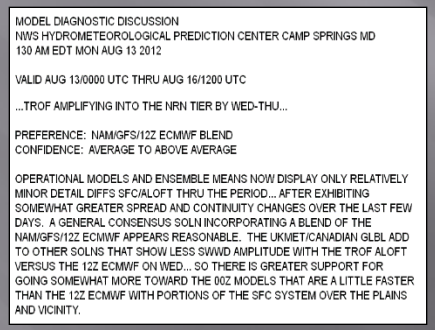
Medium Range



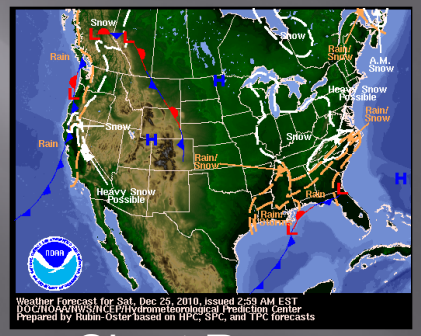
Alaska Med. Range



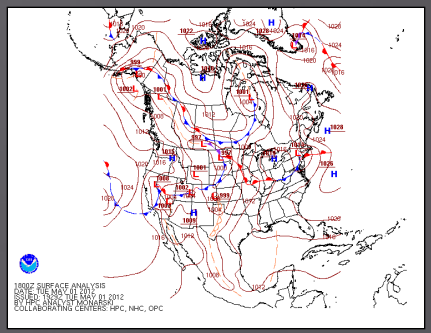
Met Watch



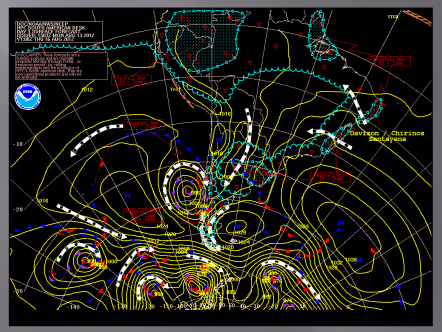
Model Diagnostics



Short Range



Surface Analysis



International

Tropical

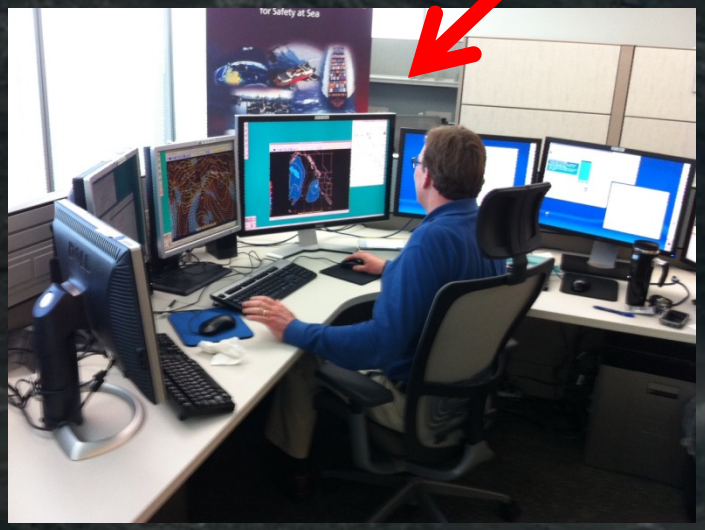
NOAA National Weather Service

OPC and TAFB

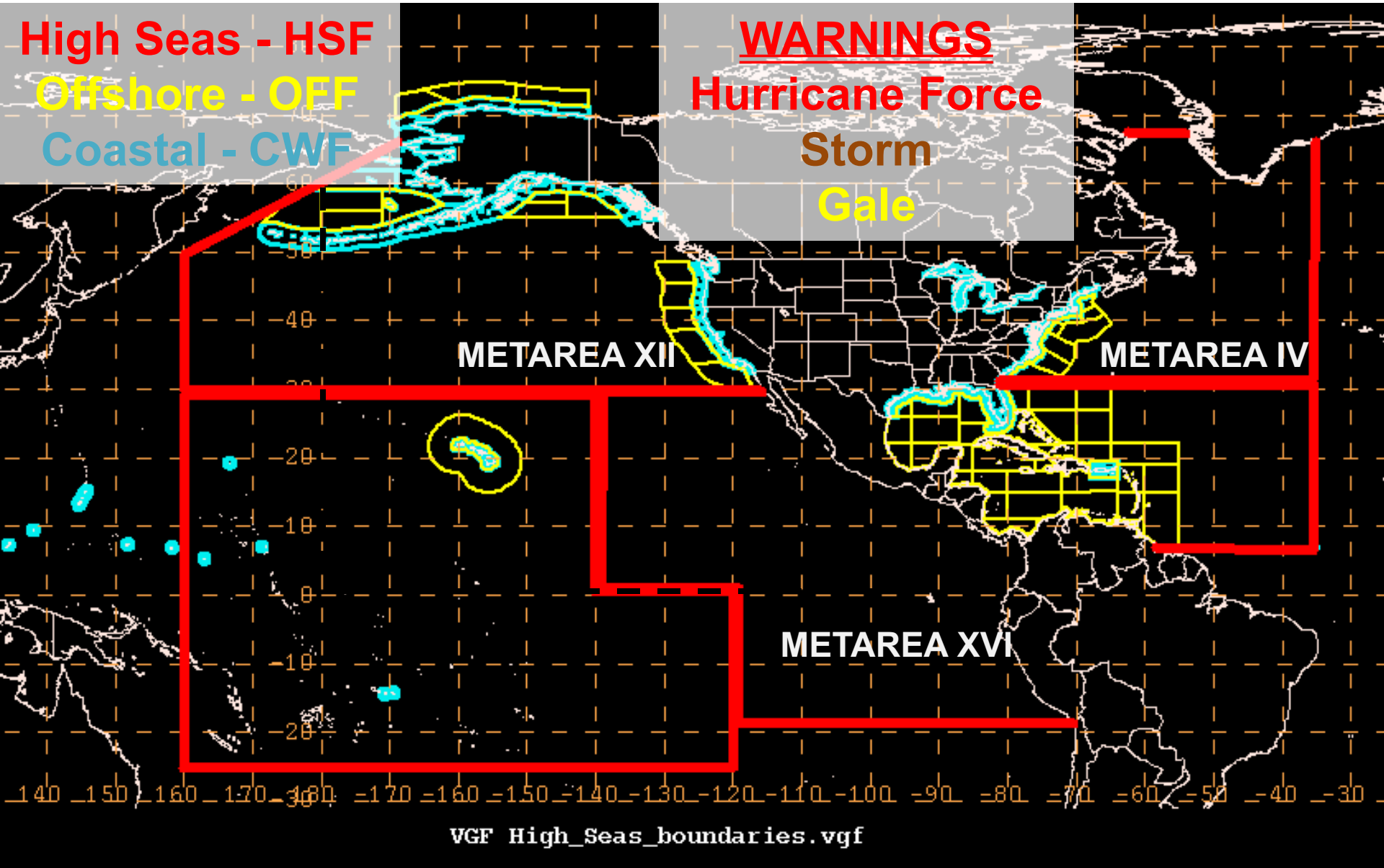
As of April 2017: OPC – 17/20 forecasters, TAFB – 15/18 forecasters

- Atlantic and Pacific High Seas
- Atlantic, Pacific, Gulf of Mexico, and Caribbean Offshore Zones
- Outlook (Medium Range)
- Special Project Support
  - Antarctica NMFS
  - USCG Arctic (with AR)
  - Japan
- Tropical Cyclone Classifications (TAFB only)

My Cube



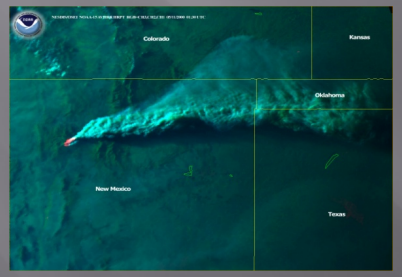
NOAA/NWS Marine Responsibility

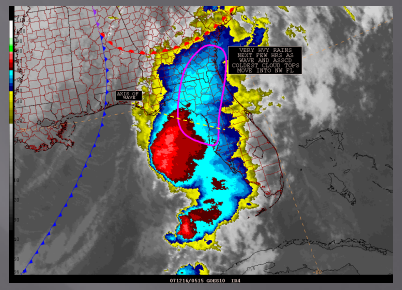


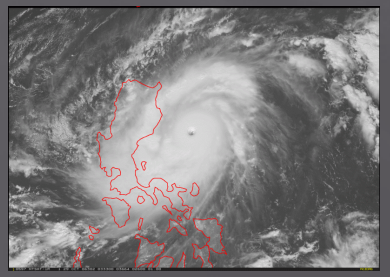
NESDIS Satellite analysis Branch

As of April 2017: 16/21 analysts

- **The Smoke, Fire and Air Quality Program**
- **The Precipitation Program**
- **The Volcanic Ash Program**
- **The Tropical Program**







Training Conducted at the MPS PG

- All training to this point has been conducted in person, either individually or in small groups (3-5 forecasters/analysts at a time)
- Use PowerPoint presentations, then a Quick Guide is made available for the forecasters to get quick answers to analysis questions. COMET modules and blogs are also shared.
- The Liaison interacts with forecasters post training to discuss the products and points out significant uses when necessary.
- More formal, 8-hour Himawari Course was held the second half of 2016 to introduce forecasters to the 16-channels on the Advanced Himawari Imager. This included labs and material developed by our colleagues at CIMSS.
  - Forecasters really enjoyed the labs due to interactivity with the imagery and concepts.

Training Conducted at the MPS PG

- These methods have proven to work well with this PG, but there was some trial and error:
  - The difference between introducing products and providing application based examples
  - Determining whether a product is useful for a particular situation, rather than just blindly introducing products (just because it's on the list).
  - Learning when it's best to find products that compliment each other, including integrated displays.

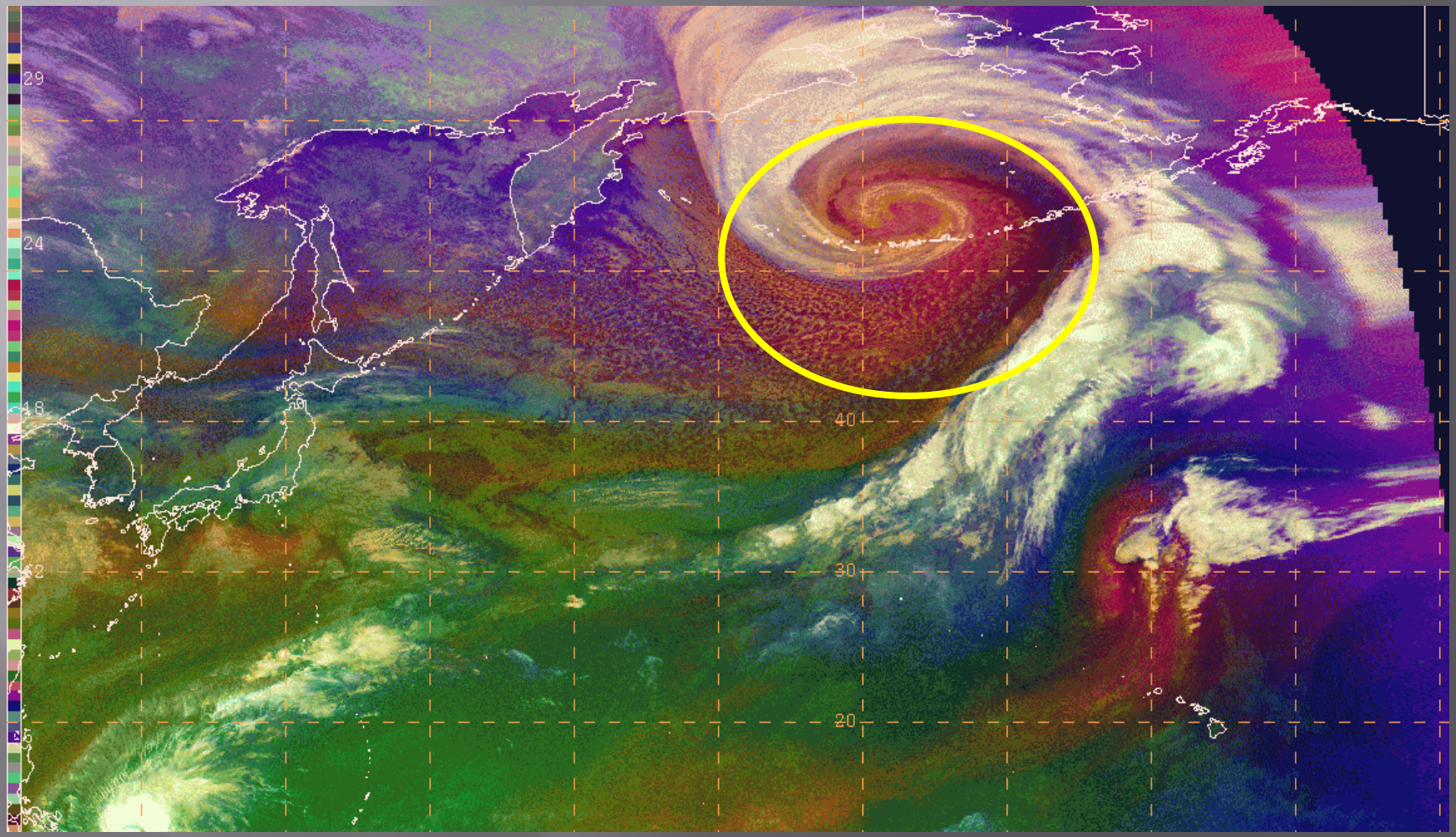
PROVING GROUND PROJECTS 2016-2017

- Hurricane-Force Extratropical Storms in the North Pacific (collaboration with AK region)
- Thunderstorm Classification in the OPC Offshore Zones
- Extratropical Transition of Tropical Cyclones
- Other Potential R2O topics

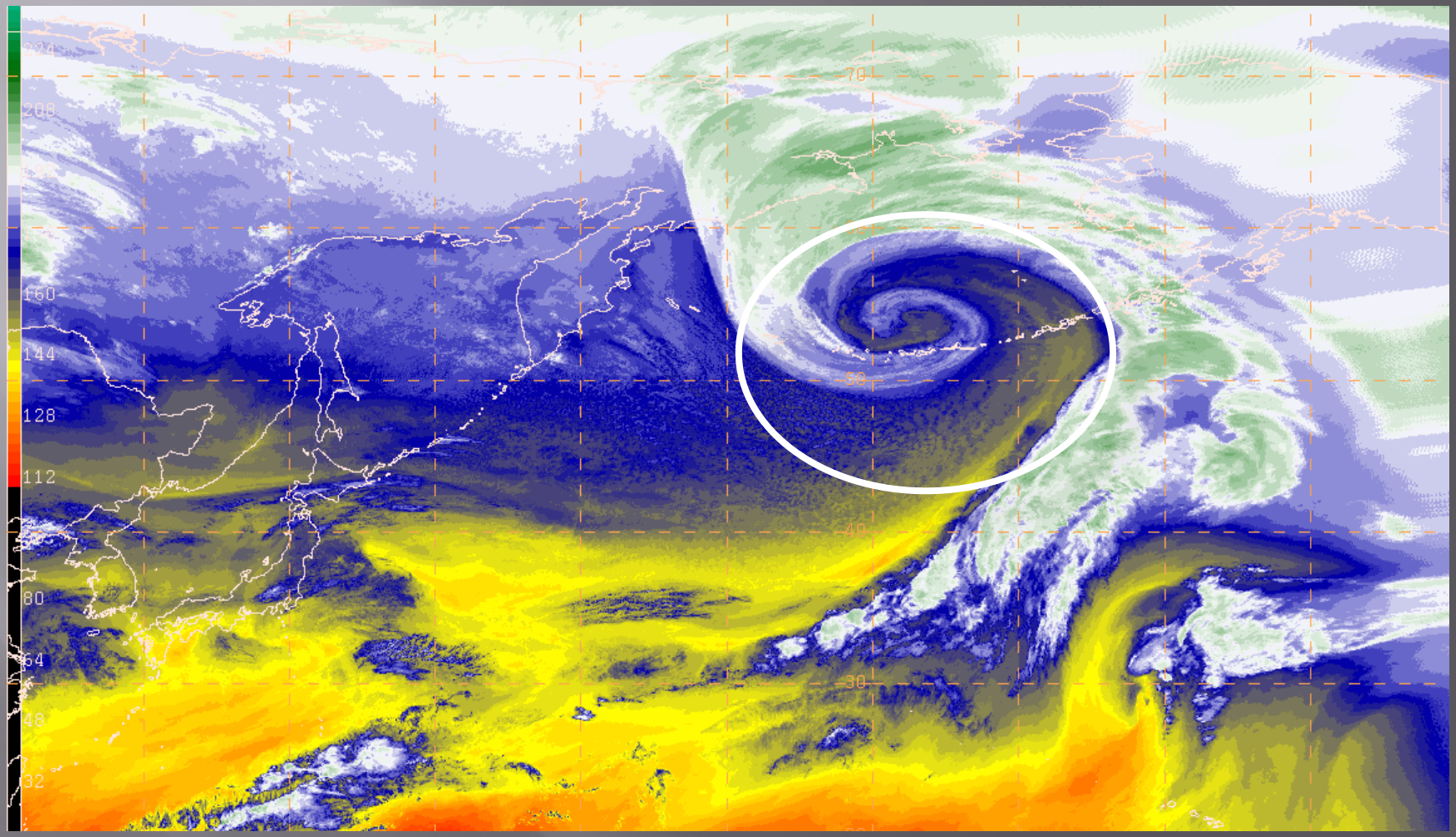
HURRICANE-FORCE EXTRATROPICAL STORMS IN THE NORTH PACIFIC

Kelsey Malloy (UMD)
Michael Folmer (CICS)
Lt. Joseph Phillips (NOAA Corp.)
Joseph Sienkiewicz (OPC)
Collaboration with Eric Stevens and Carl Dierking from the High Latitudes (AK) Proving Ground

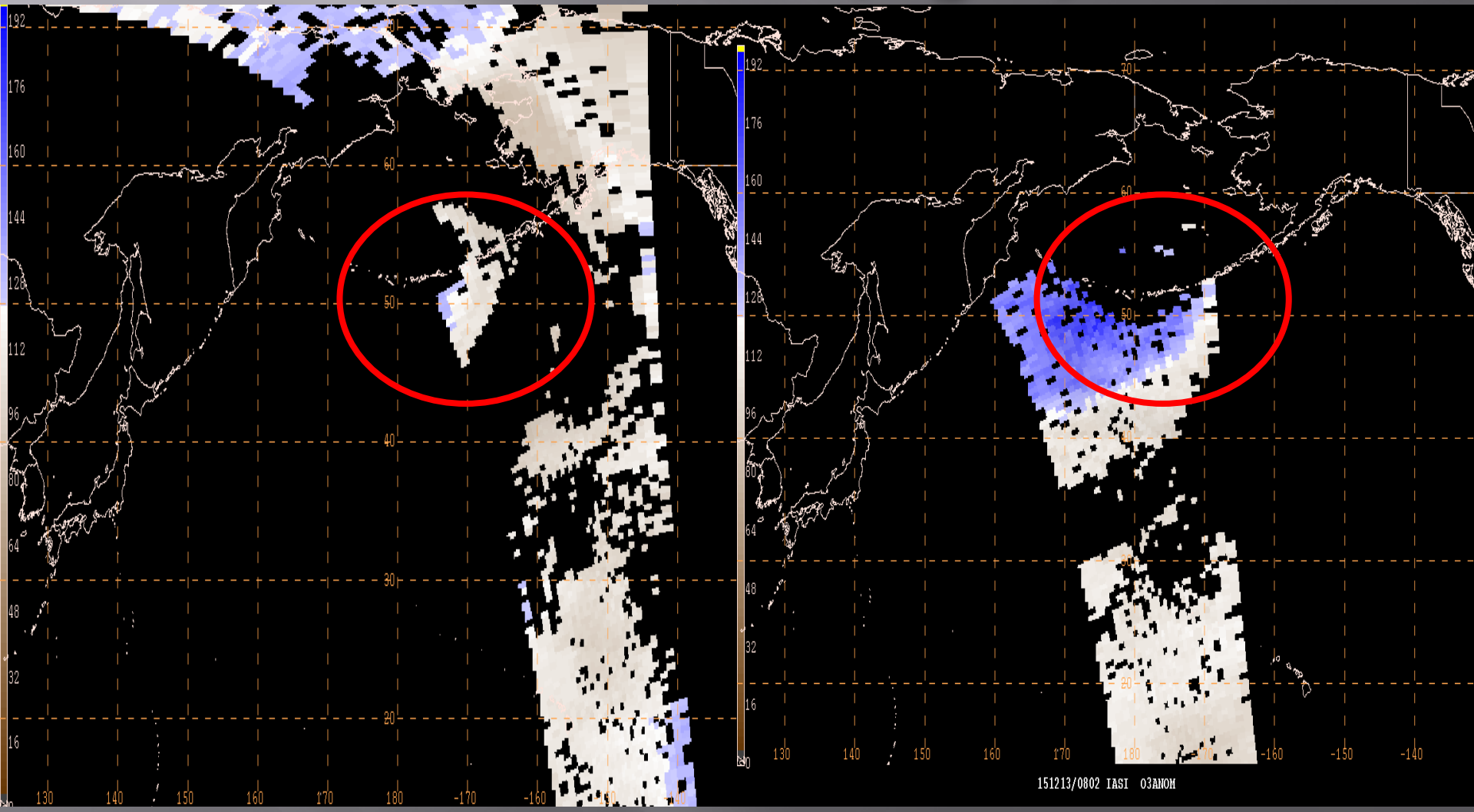
Warm Core Seclusion
Dec 13 06Z Himawari Airmass



Himawari 7.3μm WV-Low-Level
Dec 13 06Z



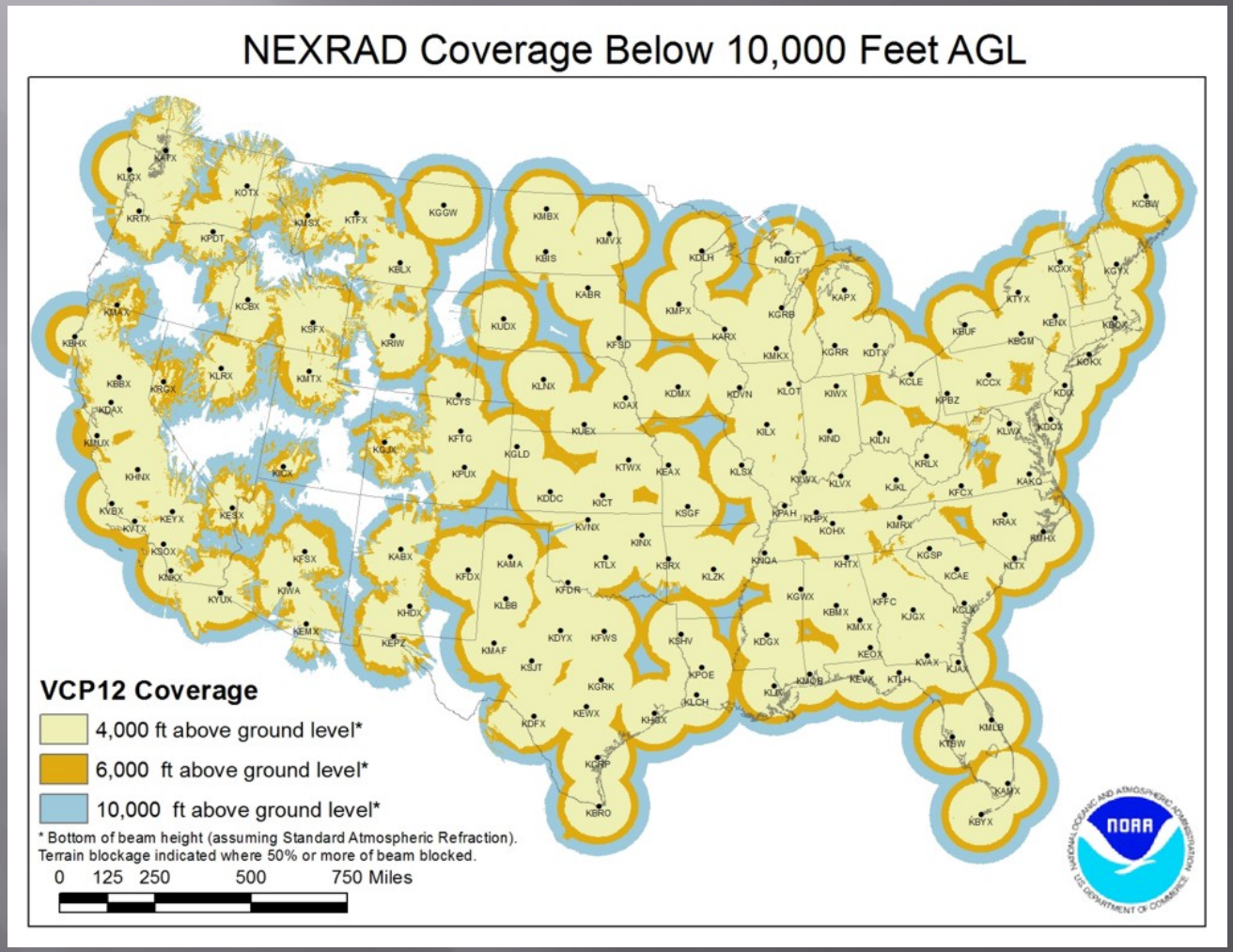
IASI Ozone Anomaly Dec 13 0702Z (left) and 0802Z (right)



THUNDERSTORM CLASSIFICATIONS IN THE OPC OFFSHORE ZONES

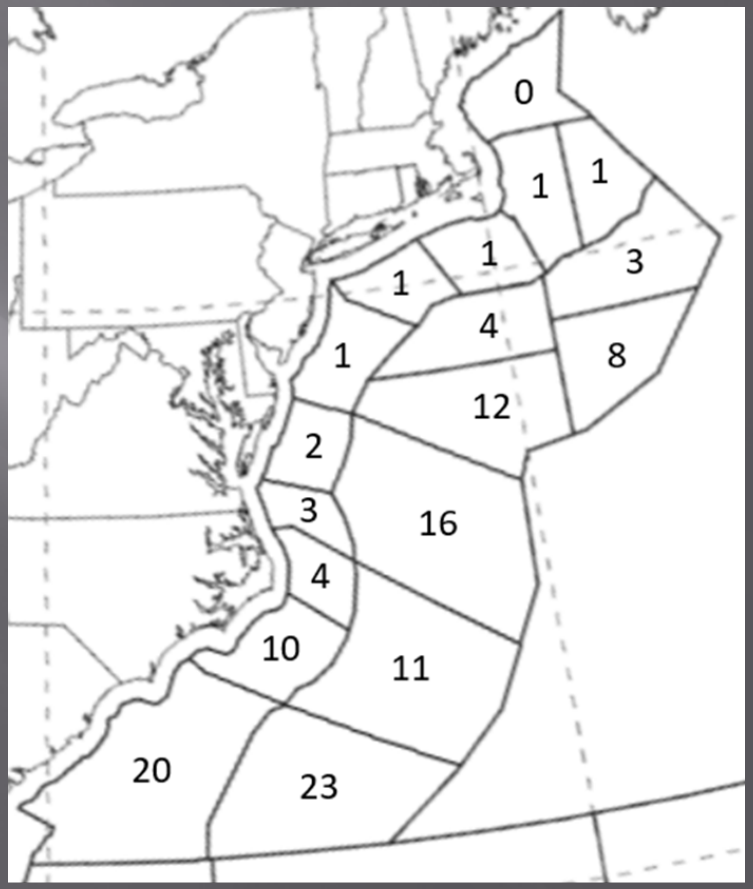
Kaille (Killian) Farrel (UMD)
Michael Folmer (CICS)
Lt. Joseph Phillips (NOAA Corp.)
Joseph Sienkiewicz (OPC)
Scott Rudlosky (NESDIS/STAR)

Limited NEXRAD Coverage in OPC/TAFB Marine Zones



Characterizing Supercells in OPC offshore zones

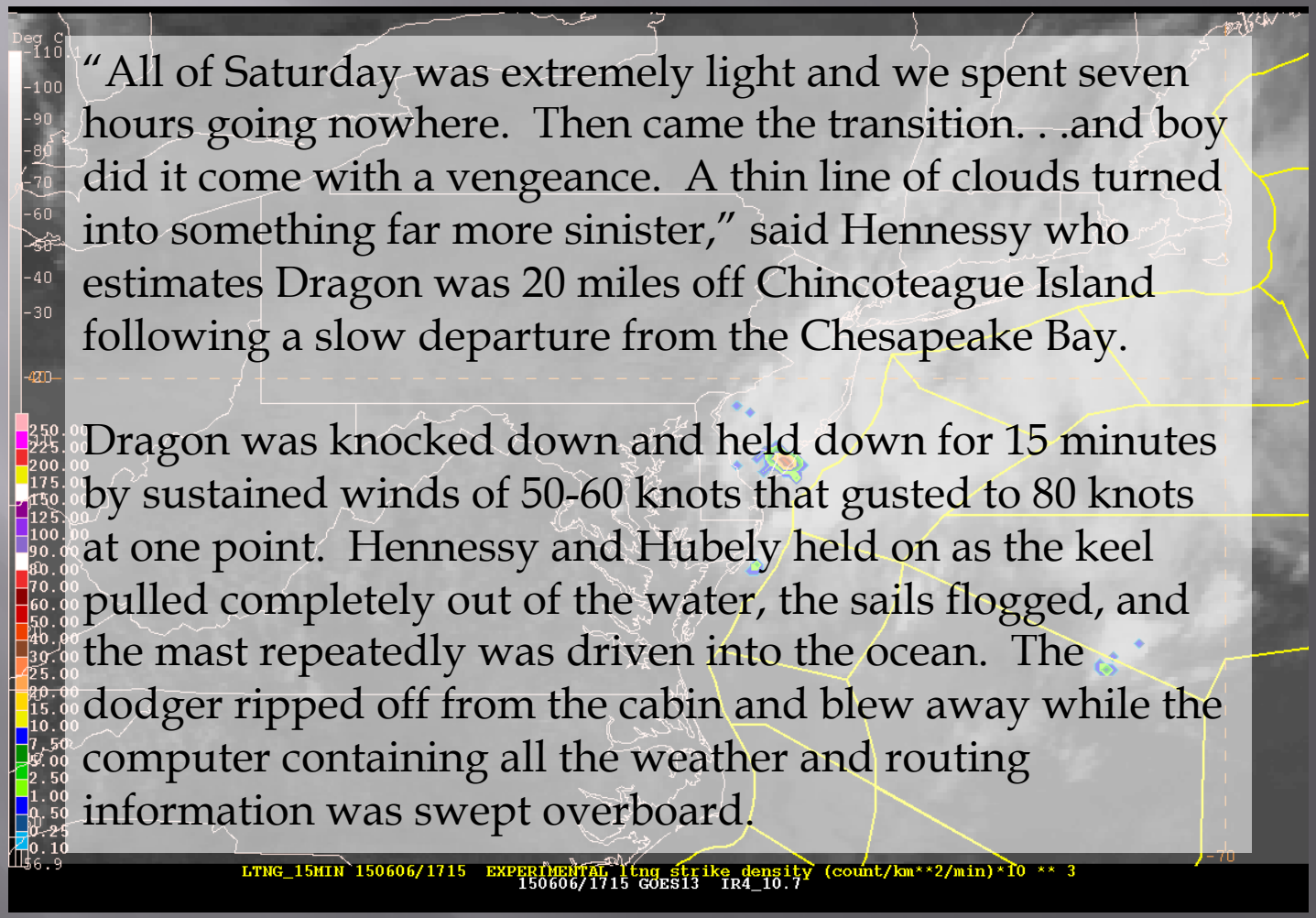
- 2014 Jan-Jun Analysis of Supercells using:
  - Lightning Density
    - GLD360 and NLDN Lightning Density Product
  - Overshooting Tops
    - NASA LaRC/CIMSS overshooting top magnitude product
    - IR Imagery (GOES-13)
    - NWP tropopause temperature forecasts



Month (2014)	Jan	Feb	Mar	Apr	May	Jun
# of Supercells	14	16	14	18	11	17

GOES-R Lightning Detection

GOES-13 IR with 15 min GLD-360 Lightning Density



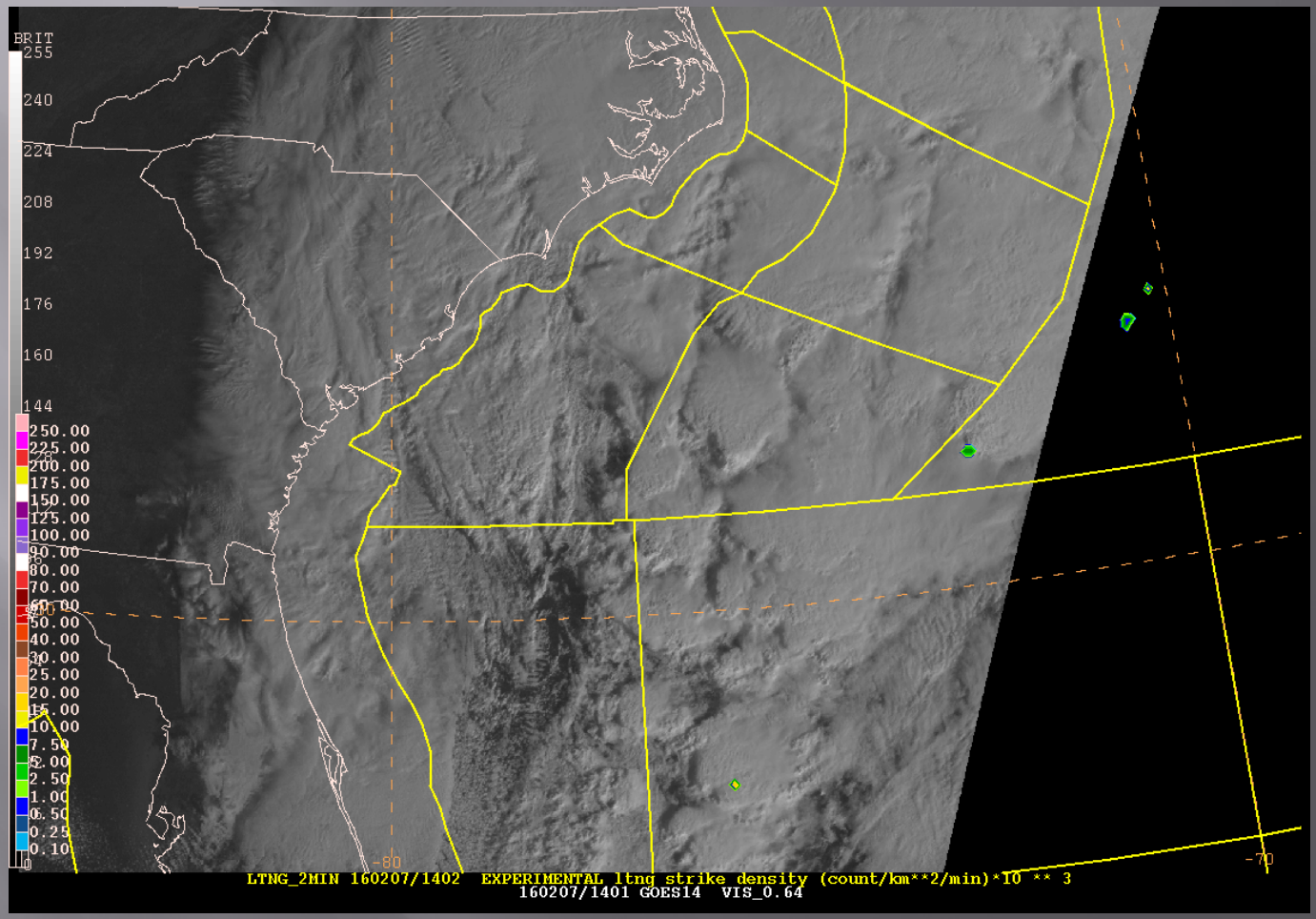
"All of Saturday was extremely light and we spent seven hours going nowhere. Then came the transition. . .and boy did it come with a vengeance. A thin line of clouds turned into something far more sinister," said Hennessy who estimates Dragon was 20 miles off Chincoteague Island following a slow departure from the Chesapeake Bay.

Dragon was knocked down and held down for 15 minutes by sustained winds of 50-60 knots that gusted to 80 knots at one point. Hennessy and Hubely held on as the keel pulled completely out of the water, the sails flogged, and the mast repeatedly was driven into the ocean. The dodger ripped off from the cabin and blew away while the computer containing all the weather and routing information was swept overboard.

Courtesy of NASA SPoRT, NRL, and Vaisala

GOES-R Lightning Detection

GOES-14 SRSOR VIS and GLD-360 2-min Lightning Density: 02/07/16 Hurricane-Force Low

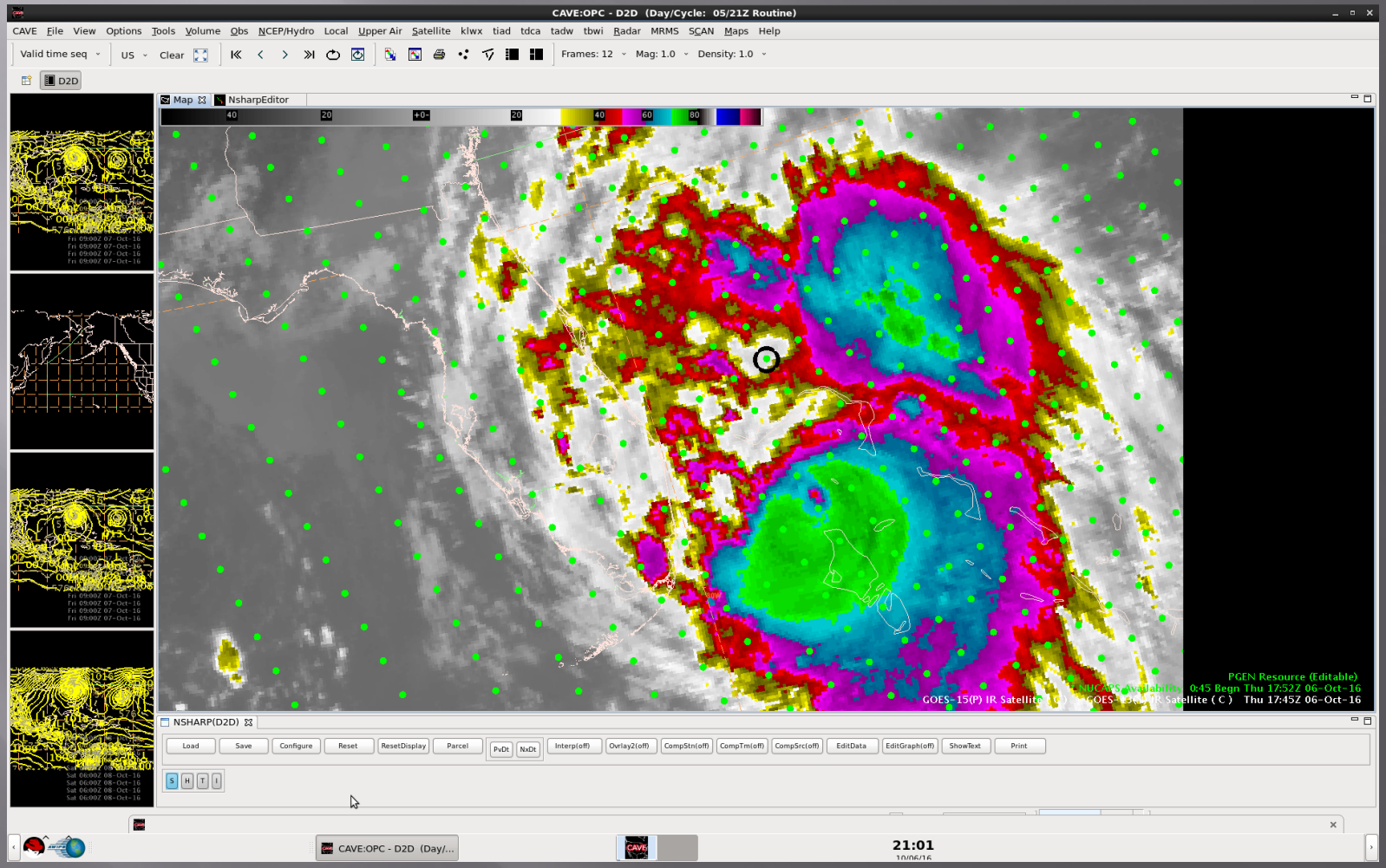


Courtesy of CIRA, OPC, and Vaisala

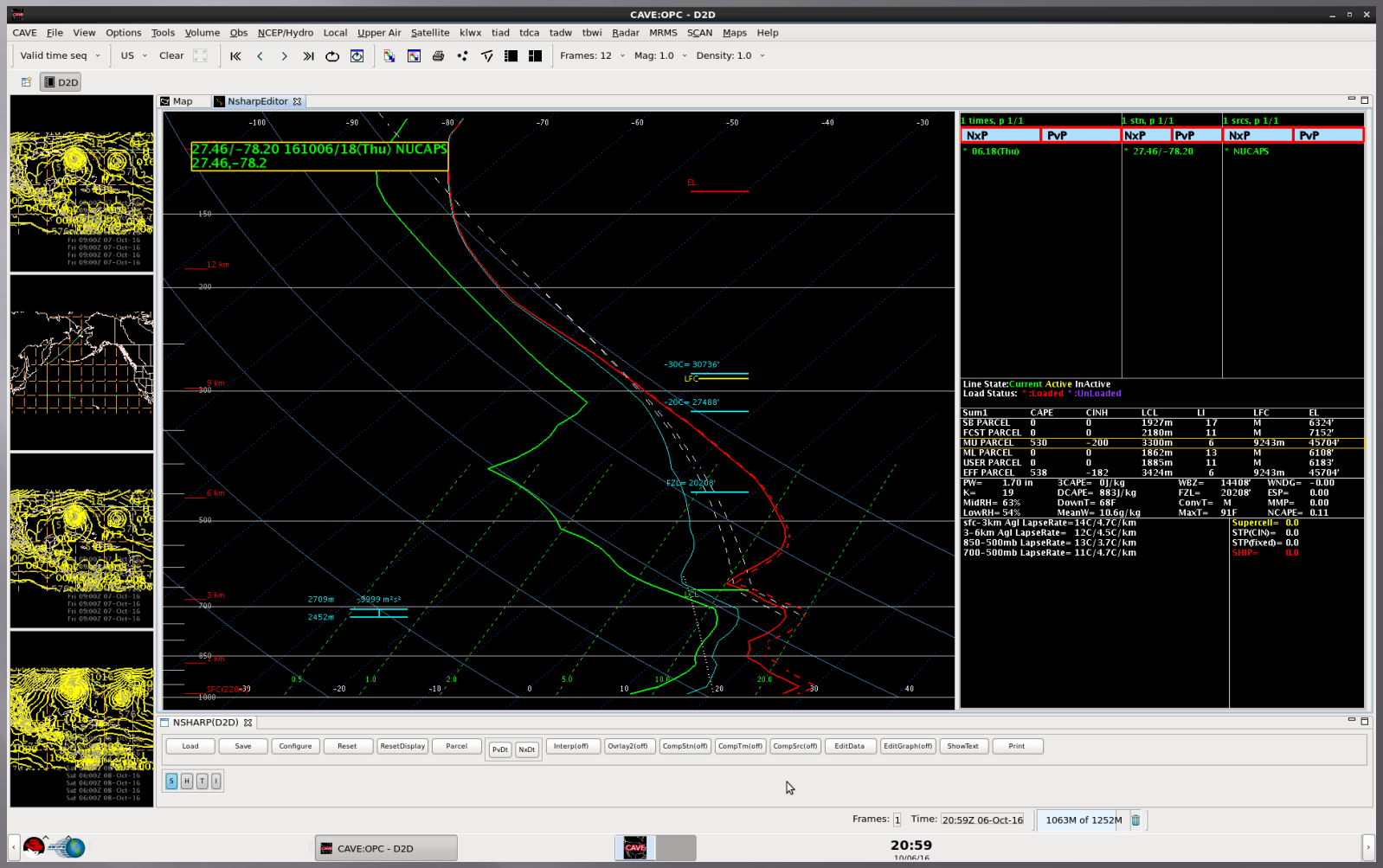
EXTRATROPICAL TRANSITION OF TROPICAL CYCLONES

Emily Berndt (NASA SPoRT)
Michael Folmer (CICS)
Jason Dunion (HRD)
Jeffrey Halverson (UMBC)
NHC

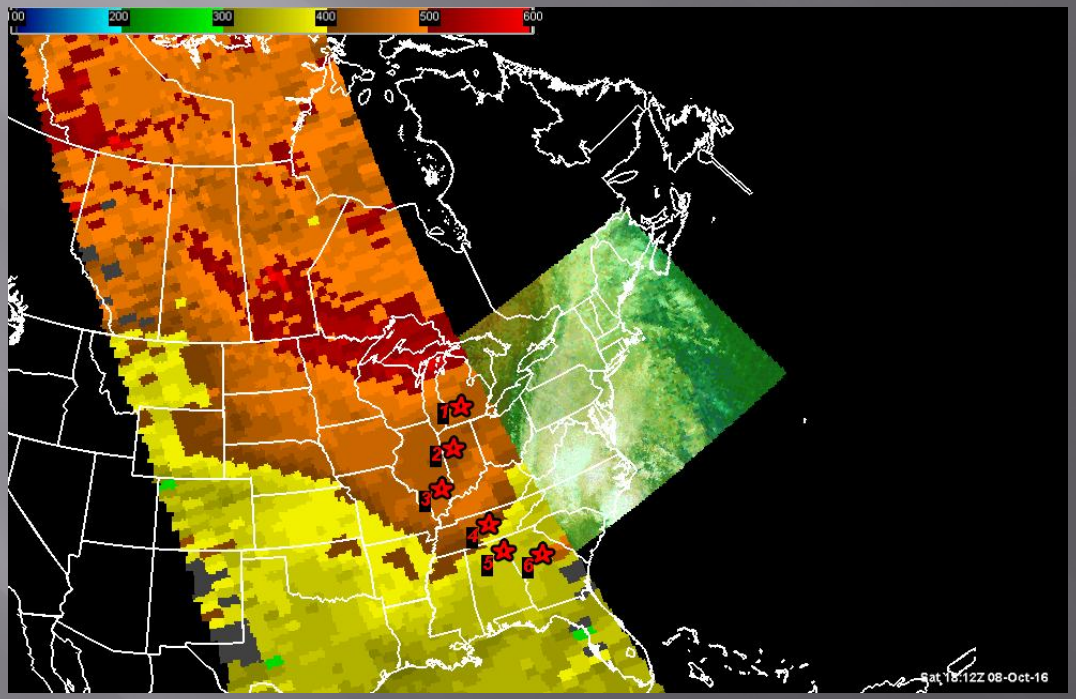
Hurricane Matthew Examples:
NUCAPS in AWIPS II (D2D)



Hurricane Matthew Examples:
NUCAPS in AWIPS II (D2D)



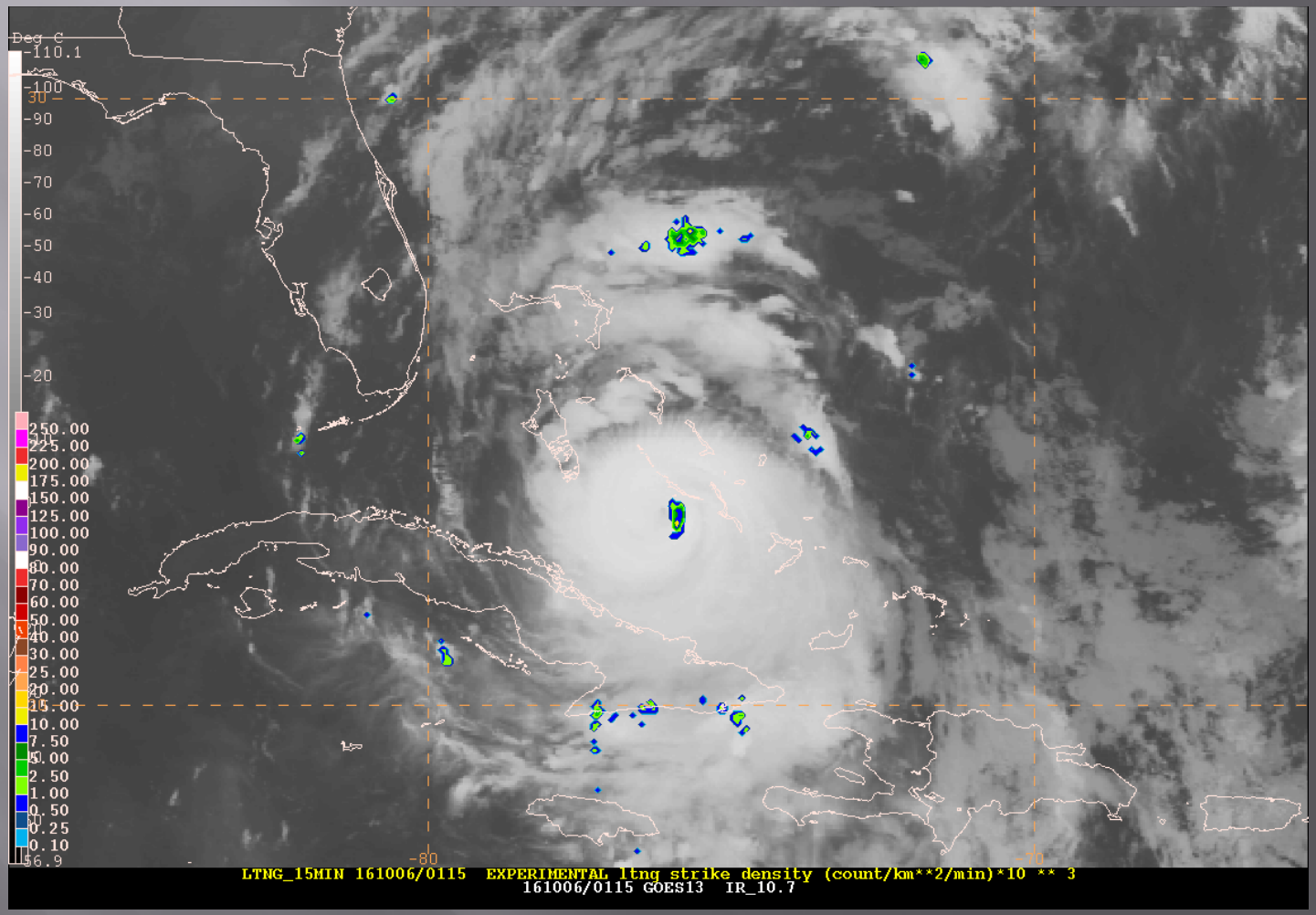
NUCAPS Tropopause Level MODIS Air Mass 10/8/16 1910-1930 UTC



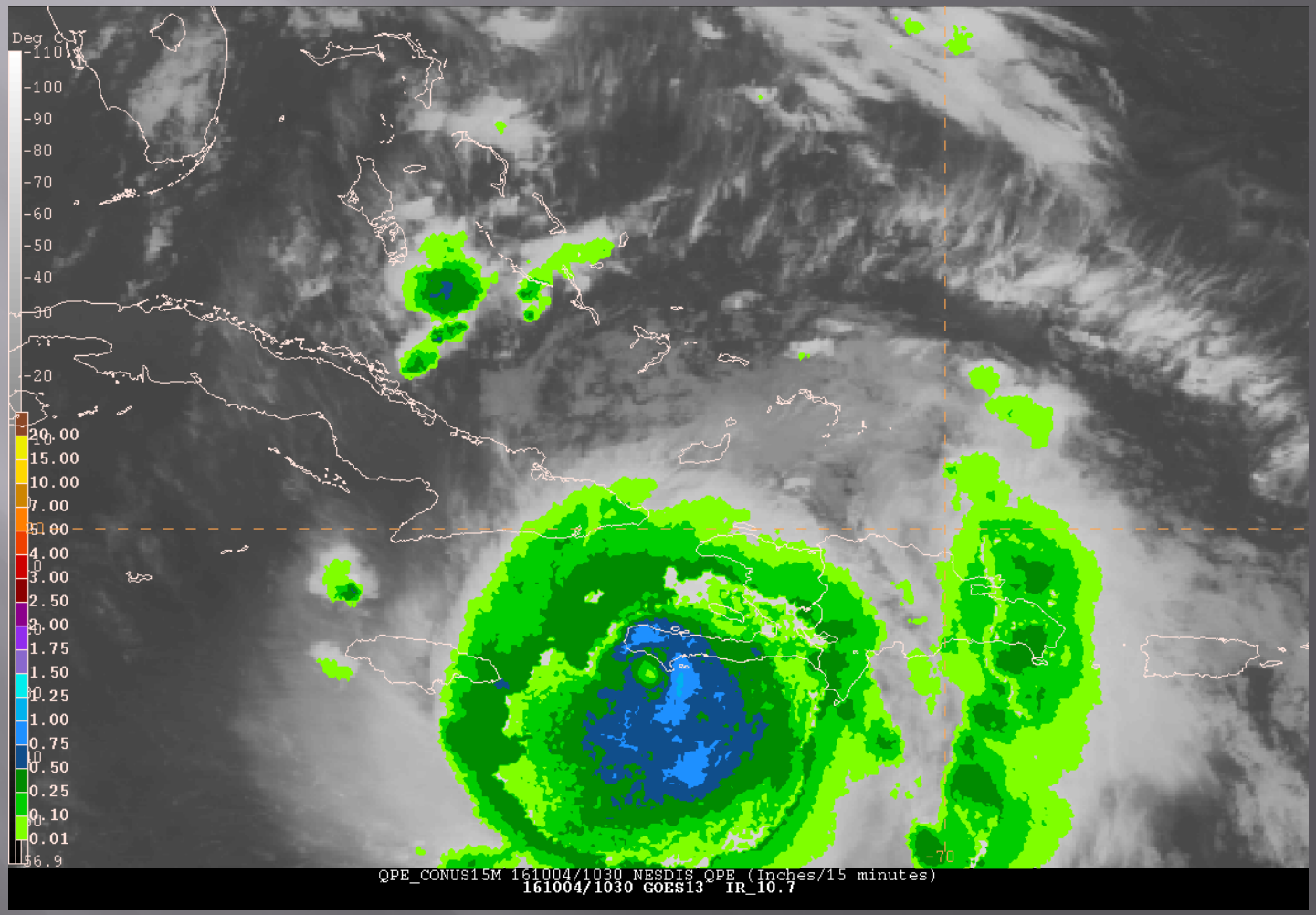
OTHER R2O TOPICS

- GLM and Tropical Cyclones (NHC)
- QPE/Rain Rate for Tropical Cyclones (TAFB)
- Tracking Easterly Waves using the CIRA Layered PW Product (TAFB)
- Using SRSO for Heavy Rain Events (WPC)
- Tracking SO2 and Volcanic Ash using Multispectral Imagery (SAB)

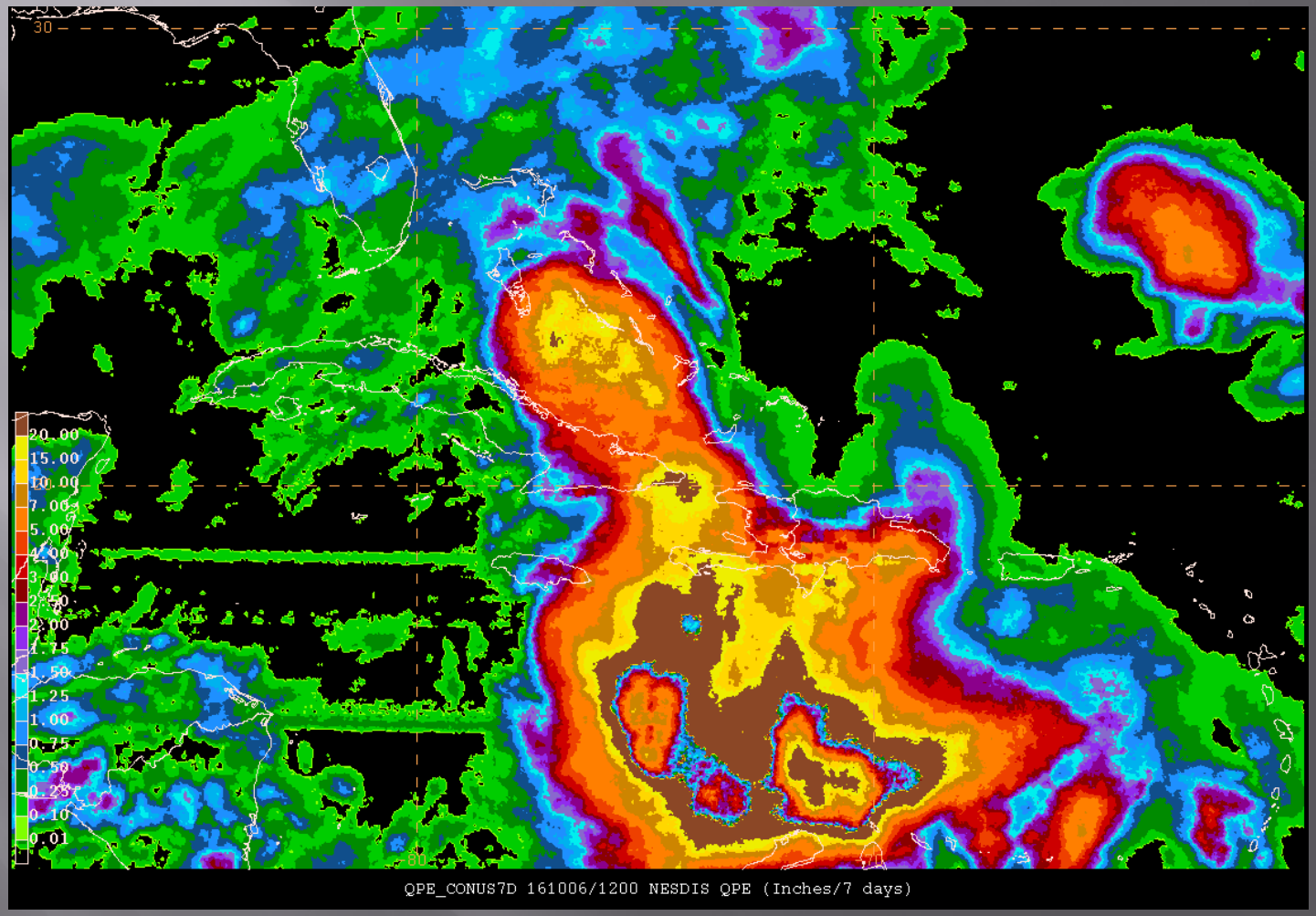
Hurricane Matthew Examples:
GLD360 Lightning Density



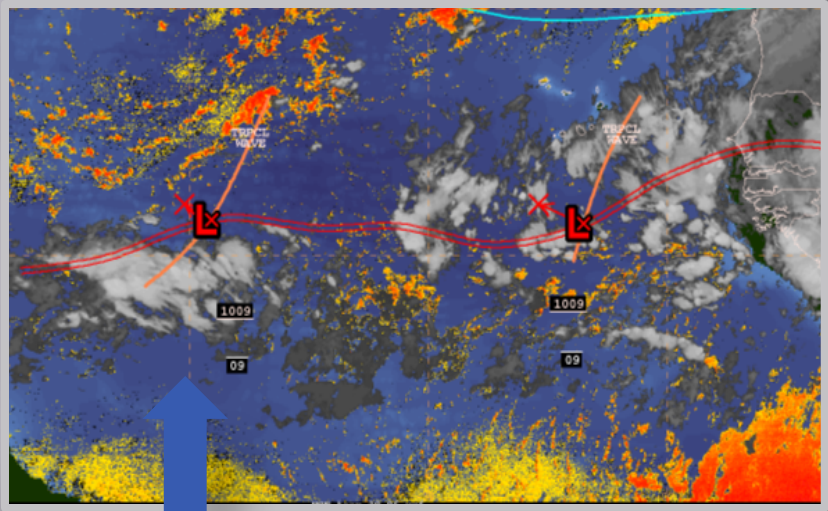
Hurricane Matthew Examples:
QPE/Rain Rate – 15 min

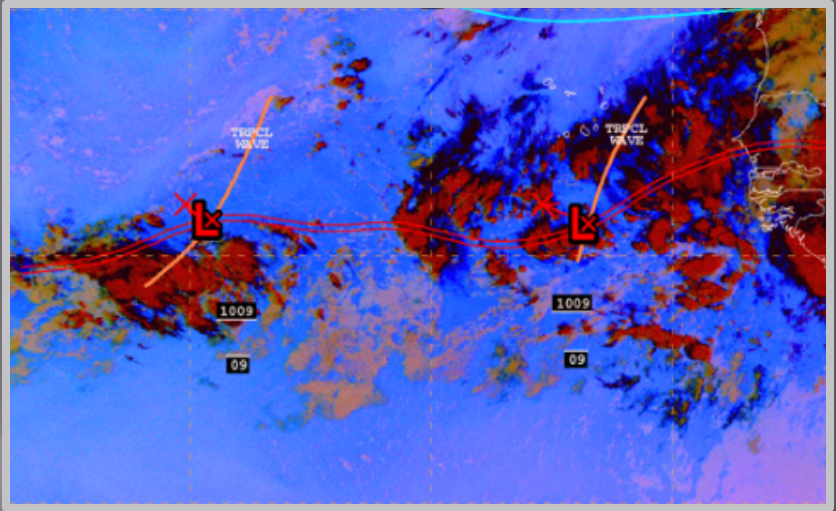


Hurricane Matthew Examples:
QPE/Rain Rate – 7 Day Accumulation

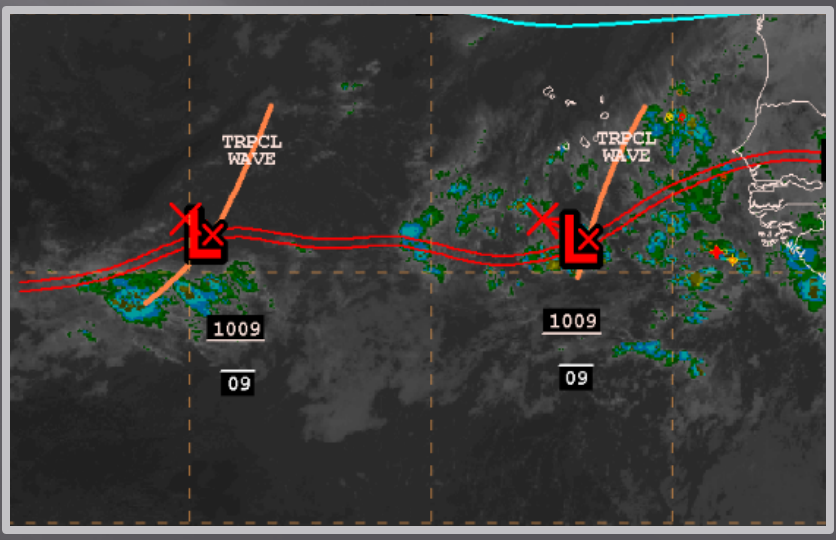


Air Mass RGB: AEWs analysis
09/30/15

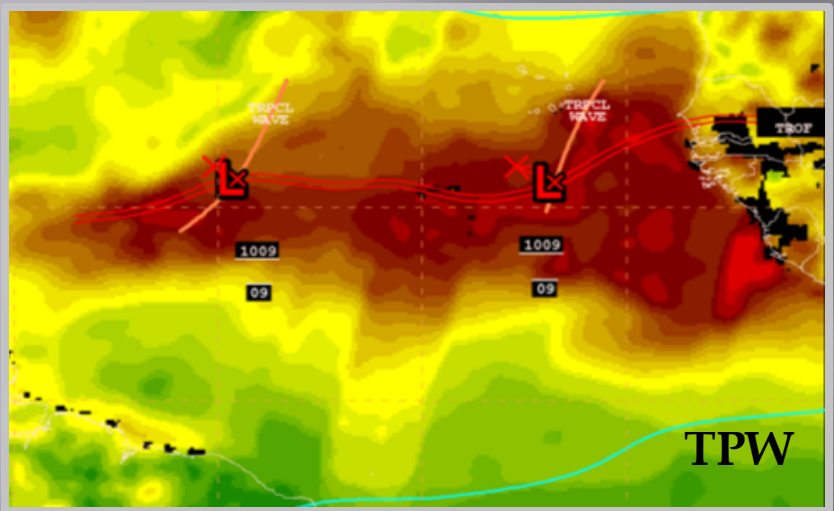


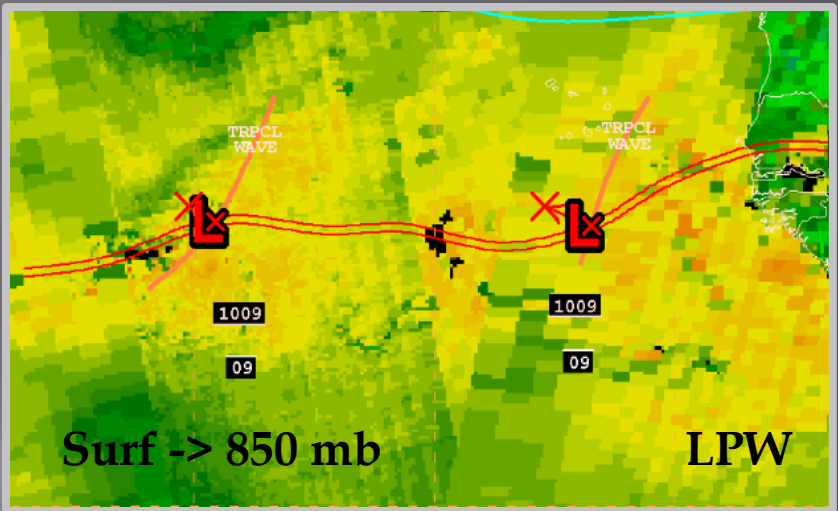


A TROPICAL WAVE IS IN THE CENTRAL ATLC WITH TILTED AXIS EXTENDING FROM 16N36W SW TO A 1009 MB LOW PRESSURE CENTER EMBEDDED IN THE MONSOON TROUGH NEAR 11N39W...MOVING W AT 5-10 KT. CIRA LAYER PRECIPITABLE WATER IMAGERY SHOW THE WAVE IS EMBEDDED IN A MODERATE MOIST ENVIRONMENT FROM THE SURFACE TO 850 MB. HOWEVER...SOME DRY AIR INTRUSION IS ALSO DEPICTED IN THE N-NW WAVE ENVIRONMENT...WHERE METEOSAT ENHANCED IMAGERY SHOW DRY AIR AND DUST. SCATTERED MODERATE CONVECTION IS FROM 07N TO 10N BETWEEN 36W AND 44W.



Layer Precipitable Water (LPW): AEWs tracking and analysis 09/30/15





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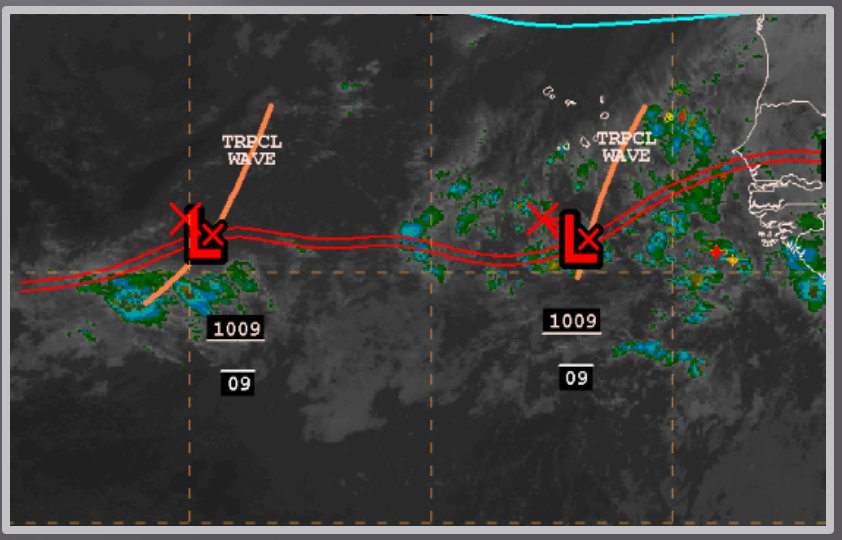
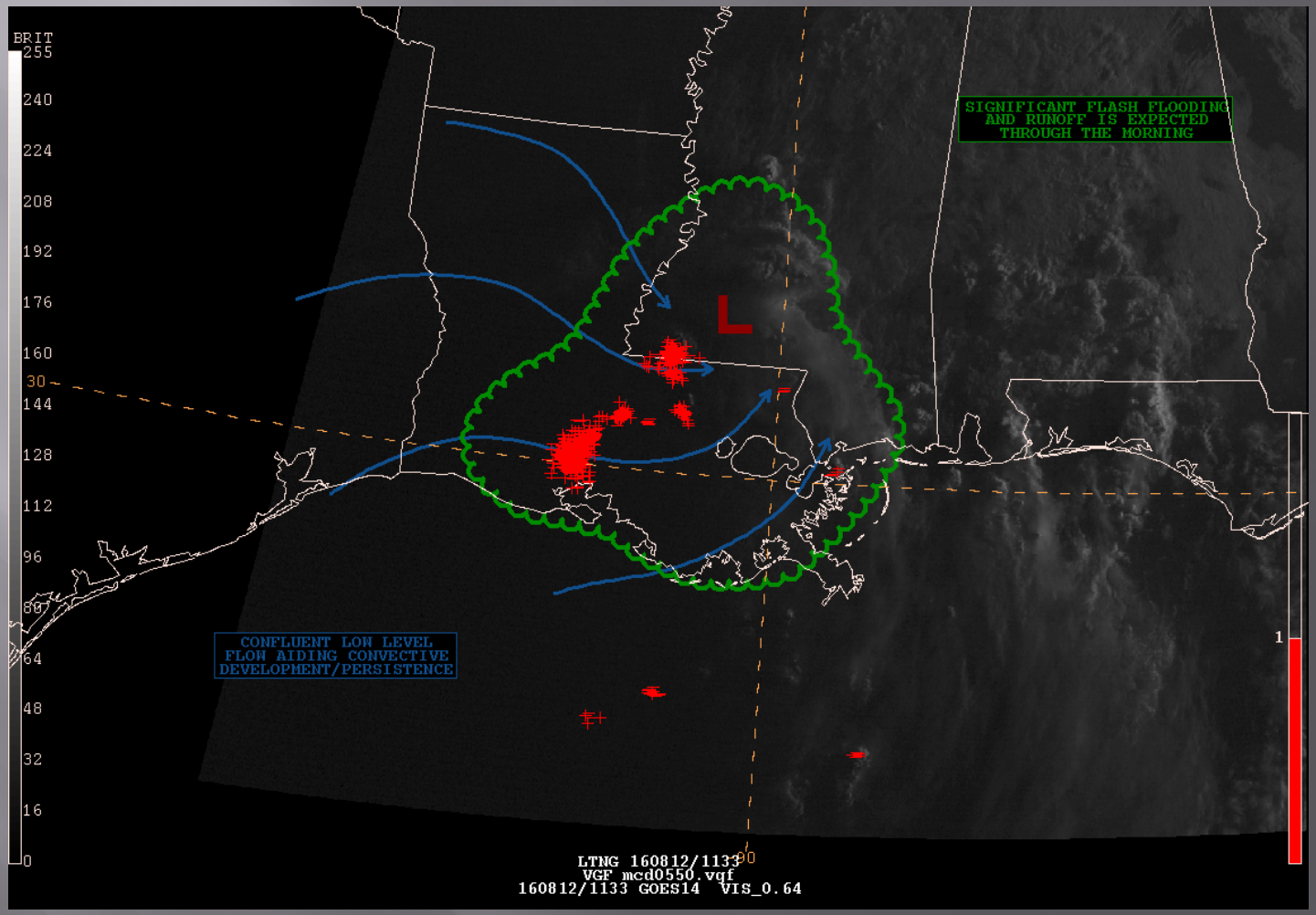
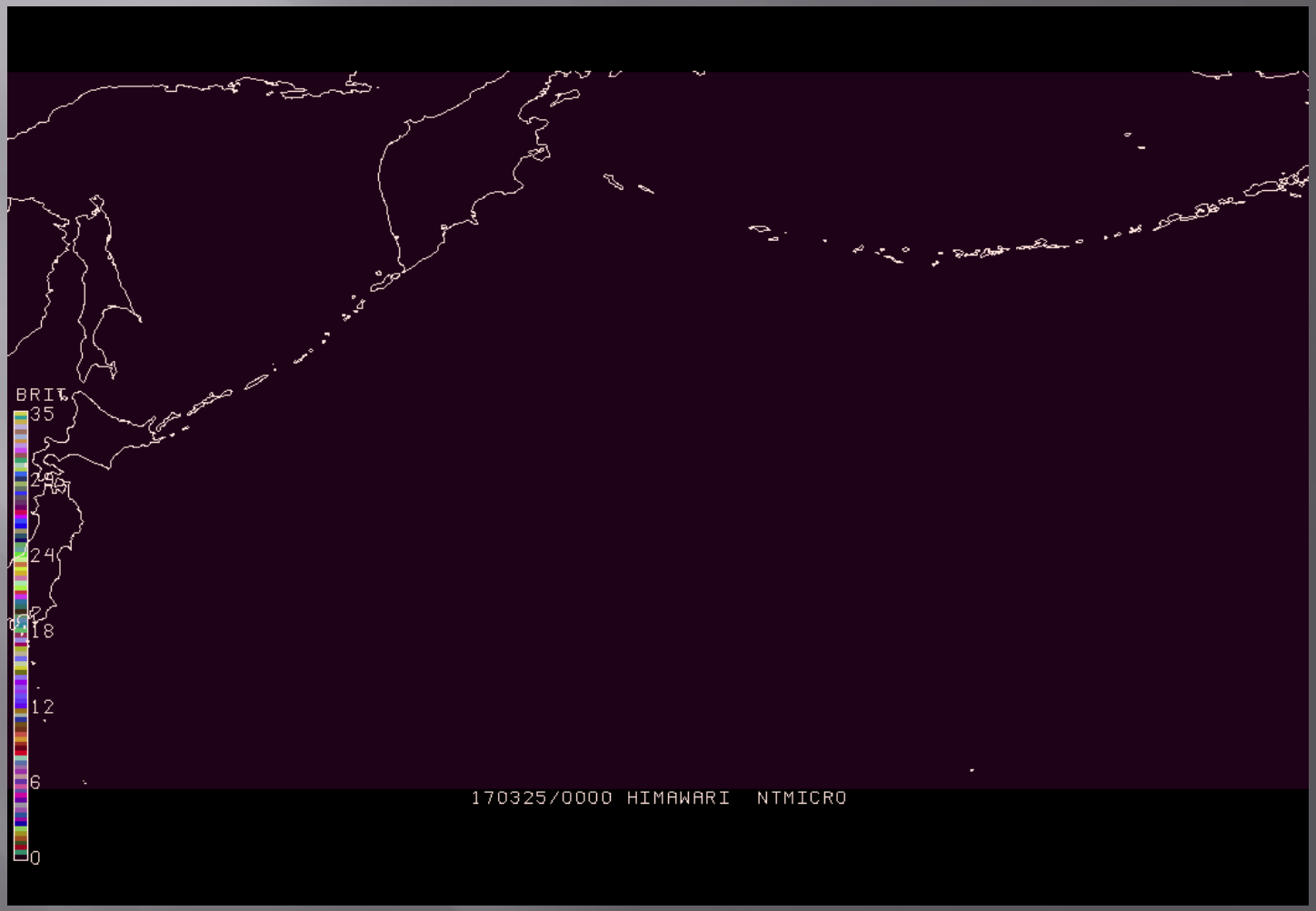


GOES-14 1-minute Visible Imagery with WPC Mesoscale Precipitation Discussion Graphic

Louisiana Flooding Event on 08/12/16



Kambalny Eruption on 03/25/17
Himawari-8 Nighttime Microphysics RGB



2017 GOES-16 and JPSS Demonstrations
03/10/17 – 12/31/17

- **Organizations and Participants:**
  - Ocean Prediction Center (OPC), College Park, MD
  - Weather Prediction Center (WPC), College Park, MD
    - Hydrometeorological Testbed
  - NESDIS Satellite Analysis Branch (SAB), College Park, MD
  - NHC Tropical Analysis and Forecast Branch (TAFB), Miami, FL

- **Products to be Demonstrated**
  - GOES-16 L2 Imagery and Products (letter indicates center listed above)
    - Aerosol Detection (a, c, d)
    - Aerosol Optical Depth (a, c, d)
    - Cloud & Moisture Imagery (a, b, c, d)
    - Cloud Optical Depth (a, d)
    - Cloud Particle Size Distribution (b, c)
    - Cloud Top Height (a, b, c, d)
    - Cloud Top Phase (a, b, c)
    - Cloud Top Pressure (a, b, c)
    - Cloud Top Temperature (a, b, c, d)
    - Derived Motion Winds (a, b, c, d)
    - Derived Stability Indices (a, b, c, d)
    - Fire/Hot Spot Characterization (c, d)
    - Hurricane Intensity Estimation (a, b, c, d)
    - Land Surface Temperature (skin) (a, b, c, d)
    - Legacy Vertical Moisture Profile (a, b, c, d)
    - Legacy Vertical Temperature Profile (a, b, c, d)
    - Rainfall Rate / QPE (a, b, c, d)
    - Sea Surface Temperature (skin) (a, b, c, d)
    - Snow Cover (a, b, c)
    - Total Precipitable Water (a, b, c, d)
    - Volcanic Ash: Detection & Height (a, c, d)
    - Lightning Detection: Events, Groups, Flashes (a, b, c, d)

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03/10/17 – 12/31/17

- **Organizations and Participants:**
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  - Weather Prediction Center (WPC), College Park, MD
    - Hydrometeorological Testbed
  - NESDIS Satellite Analysis Branch (SAB), College Park, MD
  - NHC Tropical Analysis and Forecast Branch (TAFB), Miami, FL

- **Products to be Demonstrated**
  - GOES-16 Future Capabilities
    - GOES-R Lightning Detection (a, b, c, d)
    - Overshooting Tops Detection (a, b, c, d)
    - GOES-R Convective Initiation (a, b, c, d)
    - Multispectral Imagery
      - Air Mass (a, b, c, d)
      - GeoColor (a, b, c, d)
      - Dust/SAL (c, d)
      - DEBRA (c, d)
      - Day Convection (a, b, c, d)
      - Day/Night Microphysics (a, b, c, d)
  - JPSS Products
    - JPSS AIRS/IASI/NUCAPS Ozone Retrievals (a, b, c, d)
    - Day-Night Band (a, c, d)
    - NESDIS Snowfall Rate (b)
    - CIRA Layered Precipitable Water (a, b, c, d)

Conclusion

- The MPS Proving Ground is in the process of evolving to demonstrate the utility of GOES-16 and soon, JPSS-1 in operations.
- Collaborative projects are offering unique opportunities to engage students, forecasters, and other PGs to address specific forecast challenges.
  - This will lead to enhanced, application-based training and peer reviewed papers.
- A new feedback survey is hoped to increase forecaster participation by allowing for an easy way to share the good, the bad, and the ugly!

Satellite Liaison Blog

Satellite Liaison Blog | G

https://satelliteliaisonblog.com

Michael

Apps | Elkridge, MD | Storm Prediction Cent | National Hurricane Ce | ADDS - METARs | Model Analyses and C | WeatherBell | Navy/NRL TC_PAGES F | SLU WxChallenge Hor | Weather Prediction Ce | RAL | Tropical Cyclone | Other bookmarks

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Satellite Liaison Blog

GOES-R & JPSS: The Future of Weather Satellites

HOME | ABOUT THE BLOG

Posted by *Bill Line* on *04/19/2017* Edit This

Why is my GOES-16 Imagery Displaced? Parallax!

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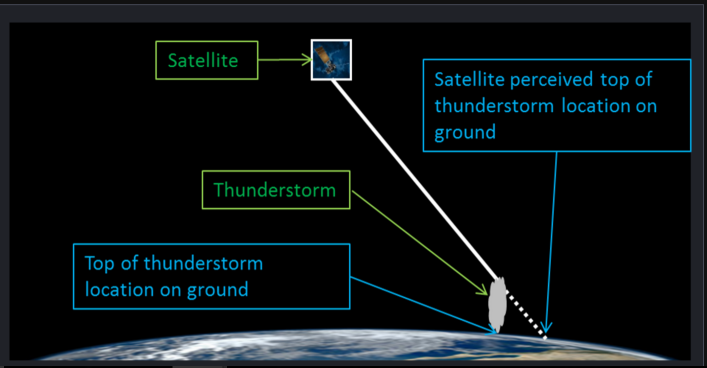
You may have noticed that high-altitude cloud features (thunderstorms) in your GOES-16 imagery appear displaced (to the north and east or west) from other data sets such as radar and lightning. This is not something unique to GOES-16 imagery, and has always been a known effect in satellite imagery. The displacement is due to to a phenomena known as parallax, and is diagrammed/explained below.



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Questions?
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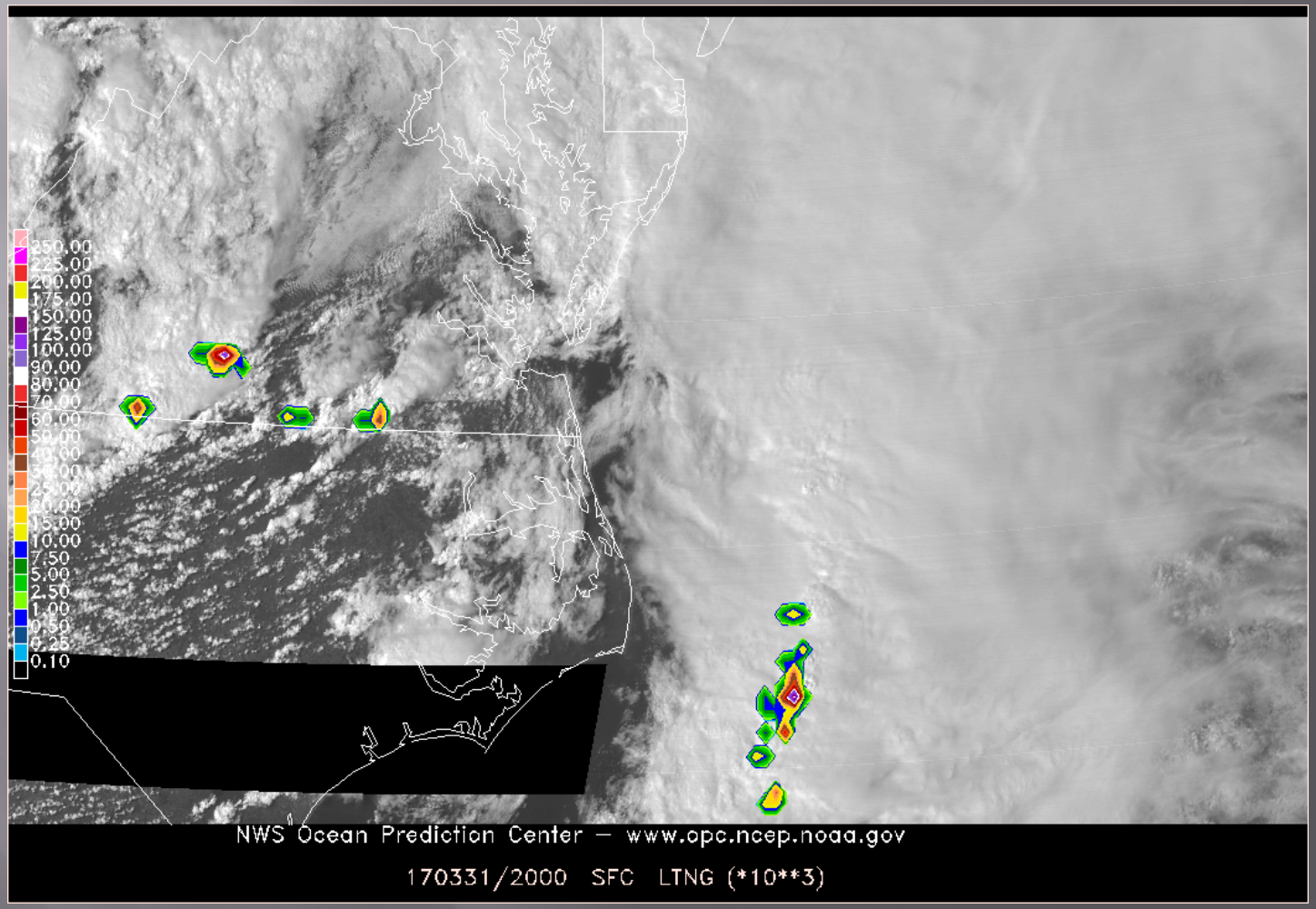

GOES-16 Meso Sector with 2-min GLD-360 Lightning Density
Southeast Virginia Tornadoes on 03/31/17